

ST LUCIA DOCUMENT COLLECTION



Author VAN DER ELST R P BLABER S J M WALLACE J H WHITFIELD A K

Title THE FISH FAUNA OF LAKE ST LUCIA UNDER DIFFERENT
SALINITY REGIMES

Source 1976 SCADCO WORKSHOP: CHARTERS CREEK FEB 1976:
APPENDIX F

Keywords

679

THE FISH FAUNA OF LAKE ST. LUCIA UNDER DIFFERENT
SALINITY REGIMES

R.P. van der Elst
Oceanographic Research Institute

S.J.M. Blaber
University of Natal

J.H. Wallace
Port Elizabeth Museum

A.K. Whitfield
University of Natal

THE FISH FAUNA OF LAKE ST.LUCIA UNDER DIFFERENT SALINITY REGIMES

INTRODUCTION

Results of the 1969-1972 research programme on teleosts in Lake St.Lucia have been published (Wallace 1975 (a and b) and Wallace and van der Elst 1975), and a resume of the most important findings appears in these proceedings (by J.H. Wallace).

This investigation, which was conducted by the Oceanographic Research Institute (Durban) was taken further in 1975 by the Zoology department of the University of Natal (Pietermaritzburg).

While interesting and very worthwhile facts concerning the life histories of estuarine teleosts have been made available, no comparison has thus far been made between the two programmes. This is of particular importance as the earlier survey was carried out during conditions of extreme hypersalinity while the 1975 data were collected under very low saline conditions. Furthermore, the fishing gear, netting localities and sampling methods were almost identical for both programmes.

METHODS AND MATERIALS

Sampling was conducted on a monthly basis using gill, seine and cast nets. Catches were monitored from the South Lake (i.e. south of Fannies Island), the North Lake (which includes False Bay) and False Bay proper. In all netting operations the total catch was recorded while for gill netting the hours fished were also documented. A wide range of mesh sizes was used (see Wallace 1975a) ensuring a fairly even spread of selectivity. Average salinity values were calculated from the Natal Parks Board salinity records and field readings, both having been measured with a hydrometer.

RESULTS

Of major consideration are the salinity conditions prevalent in Lake St.Lucia at the times of sampling. These conditions are indicated (see Fig.1 overleaf) in the North and South Lake by

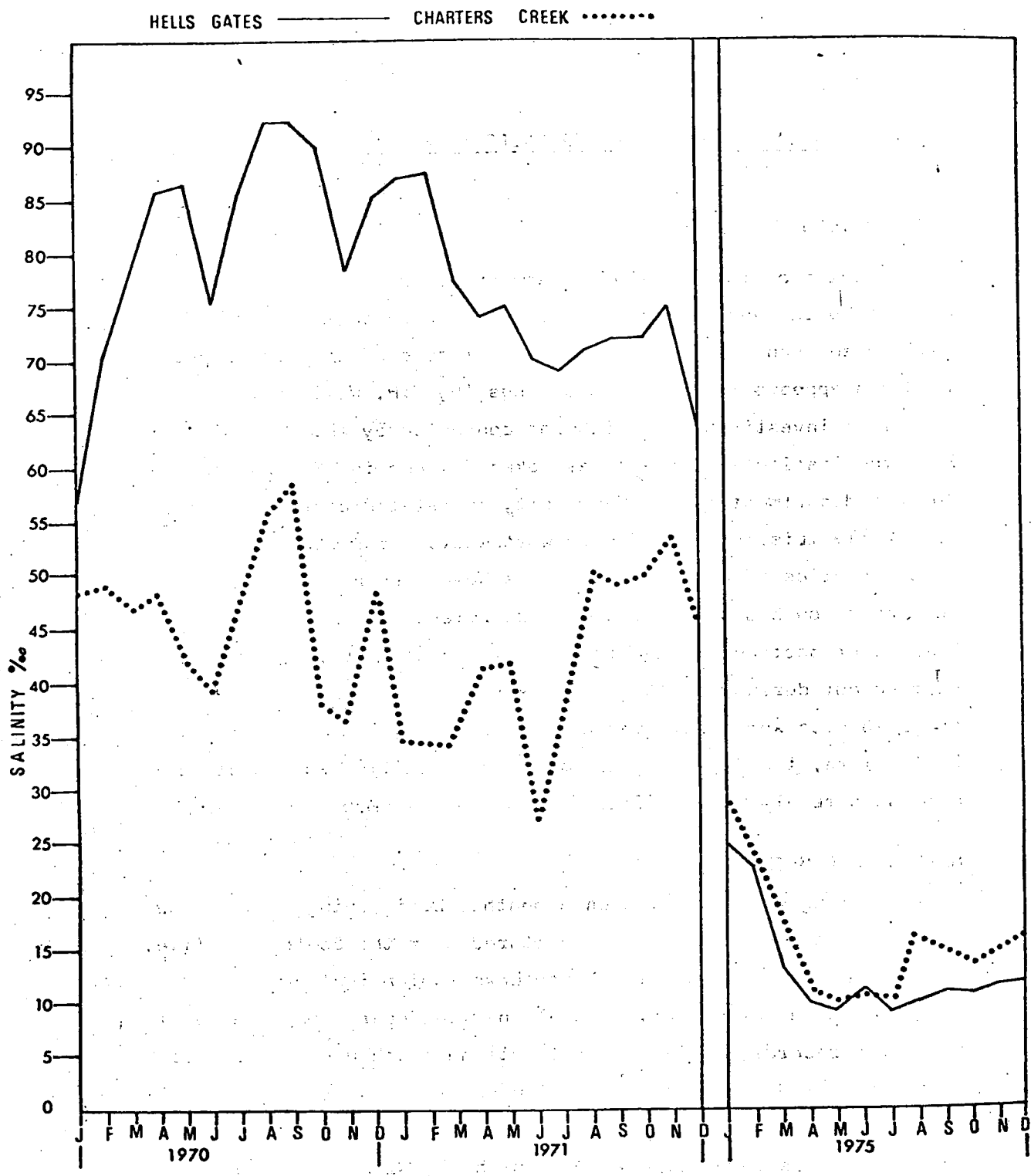


Fig.1. Averaged monthly salinity readings at two localities in Lake St. Lucia.

averaged monthly salinity readings taken at Hells Gates and Charters Creek respectively. Clearly, during 1975 the system was markedly less saline than during the 1970/1971 period. The catch analyses from the different periods can best be divided into the following four sections:

- (1) Checklists of species recorded in the system under different salinities.
- (2) Comparison of the catch per 24 net hours under different salinities.
- (3) Percentage species composition of gill net catches under different salinities.
- (4) Percentage species composition of seine net catches under different salinities.

Separation of gill and seine net catches was necessary because these two techniques sample different length classes of the fish fauna.

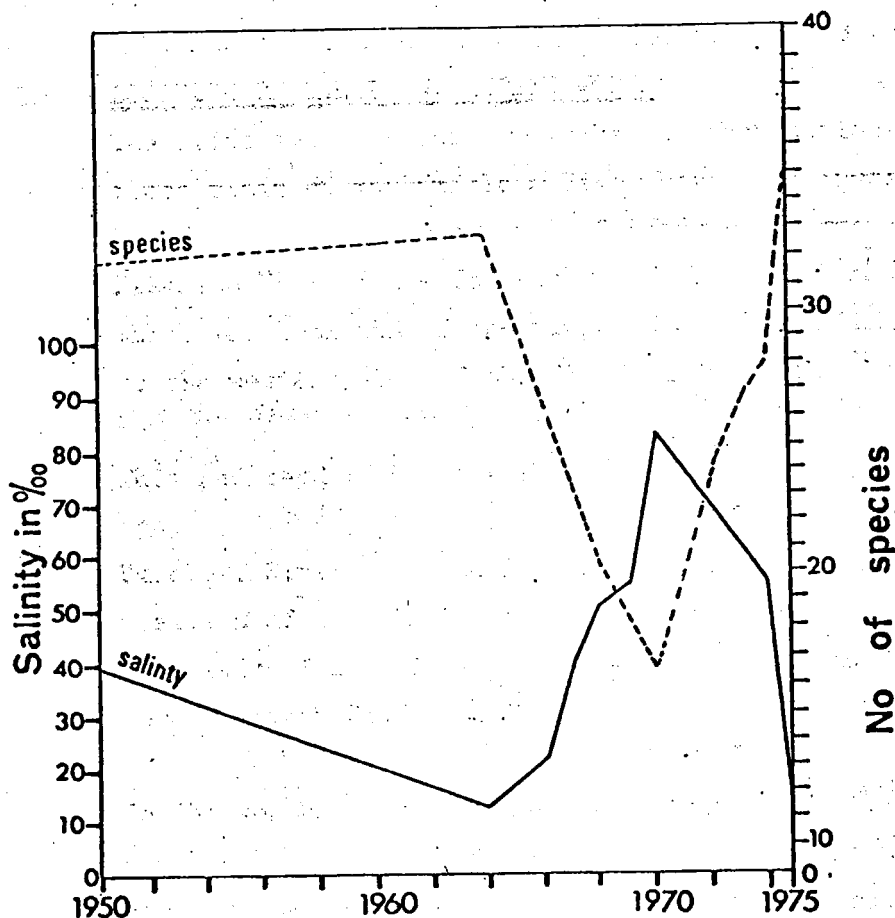
- (1) Checklist of species recorded in the St. Lucia system under different salinities.

Table 1 is a checklist of species recorded during periods of high and low salinity (i.e. 1970/1971 and 1975 respectively). Catches from the South Lake and the North Lake have been separated, although the 1975 North Lake records consist of catches in False Bay only. This could lead to an underestimate of the number of species present in the North Lake during periods of low salinity. Despite this there has been an increase of 11% in the overall number of species present when salinity levels dropped. Significantly, this increase is confined to the Northern Lake, where the relative increase was 50%. In fact, the species diversity in the South Lake was greatest during the 1970/1971 survey. This confirms earlier findings (van der Elst 1973) that hypersaline conditions in the North Lake, caused fish to move southward to more tolerable levels.

Another change that took place is the presence of fresh water teleosts. Altogether five species were recorded in the system during 1975 sampling, in contrast to only one, Sarotherodon mossambicus, in 1970/1971.

Beside the changes in species diversity outlined above, there is evidence to suggest that the number of species present in the North Lake has varied during the past 25 years with changes in salinity. In Fig.2 the number of species in the North Lake is related to the average salinity values for this area. Hells Gates was used as a representative North Lake salinity indicator station.

FIG.2 Number of fish species in N.Lake related to mean annual salinity at Hells Gates



Day, Millard and Broekhuysen (1954) recorded 33 fish species in the North Lake at an average salinity of 40‰ during their 1948-1950 surveys. In 1964/65 Millard and Broekhuysen (1970)

recorded 34 species at an average salinity of 14⁰/oo. Records kept by Champion, of fish caught incidental to his prawn surveys in 1968, indicate a reduction in the number of species present to 22, while salinities just exceeded 50⁰/oo. The ORI surveys yielded only 18 species in 1970 and 25 species in 1971 under exceedingly hypersaline conditions. The 1975 University of Natal surveys recorded a minimum of 39 species (i.e. False Bay only).

(2) Catch per 24 net hours in the South Lake under different salinities

Because the same gill nets were used during both surveys, the catch per unit effort rates are directly comparable. These rates which are presented in Table 2) reveal that abundance increased in the case of 25 species and that there has furthermore been an overall catch rate increase of exactly 100%. Several species did undergo reductions in abundance though, and the following list records the main changes in catch per 24 net hours:

<u>Decreased catch rates</u>	<u>Increased catch rates</u>
<u>Rhabdosargus sarba</u> (2.35)	<u>Hilsa kelee</u> (15.19)
<u>Mugil cephalus</u> (0.98)	<u>Johnius belengeri</u> (7.50)
<u>Liza macrolepis</u> (0.21)	<u>Thryssa vitrirostris</u> (4.09)
<u>Valamugil cunnesius</u> (0.20)	<u>Elops machnata</u> (2.88)
	<u>Argyrosomus hololepidotus</u> (0.92)
	<u>Liza dumerili</u> (0.80)
	<u>Chanos chanos</u> (0.61)
	<u>Leiognathus equulus</u> (0.57)
	<u>Rhabdosargus holubi</u> (0.52)

(3) Percentage species composition of gill net catches at different salinities

Interpretation of percentage species composition may be a little misleading because a substantial increase in the numbers of one or two small species may significantly reduce the apparent abundance of larger fish. Nevertheless, provided this limitation is borne in mind, a comparison of species composition can provide useful information.

Table 3 is a synopsis of the species composition of the gill net catches. Figures are percentage values for the overall catch and, in the case of the earlier survey, these have been separated into North Lake and South Lake. During the 1975 surveys the species composition appeared to be uniform throughout the system, hence the dates for the entire lake have been combined.

In Comparing the 1975 species composition with the combined figures for 1970 it is apparent that a number of species have changed their percentage composition. Those that have changed by more than 1% of the total composition are listed below:

<u>Decrease in composition</u>		<u>Increase in composition</u>	
<u>Rhabdosarqus sarba</u>	(10.33%)	<u>Hilsa kelee</u>	(13.26%)
<u>Muqil cephalus</u>	(9.88%)	<u>Johnius belengeri</u>	(12.47%)
<u>Pomadasys commersonni</u>	(5.94%)	<u>Elops machnata</u>	(7.67%)
<u>Liza macrolepis</u>	(5.45%)	<u>Thryssa vitrirostris</u>	(4.01%)
<u>Argyrosomus hololepidotus</u>	(3.00%)	<u>Sarotherodon mossambicus</u>	(1.31%)
<u>Liza dumerili</u>	(2.20%)		
<u>Valamuqil cunnesius</u>	(1.09%)		

It will be noted that despite the overall increase in the number of species present (section 1) many of the larger fish (i.e. those caught in gill nets) actually decreased in number. These include the top angling species, e.g. R. sarba, P. commersonni and A. hololepidotus.

(4) Percentage species composition of juveniles in seine net samples at different salinities.

Table 4 reflects the species composition of the seine net catches. Figures are again percentage values and a similar presentation has been adopted as for the gill nets.

Changes greater than 1% of total composition, are as follows:

<u>Decreased in abundance</u>		<u>Increased in abundance</u>	
<u>Pomadasys commersonni</u>	(12.64%)	<u>Thryssa vitrirostris</u>	(18.47%)
<u>Liza macrolepis</u>	(12.22%)	<u>Gilchristella aestuarius</u>	(15.68%)
<u>Chanos chanos</u>	(9.42%)	<u>Sarotherodon mossambicus</u>	(11.16%)
<u>Rhabdosarqus holubi</u>	(9.16%)	<u>Hyporhamphus knysnaensis</u>	(8.46%)

<u>Decreased in abundance</u>		<u>Increased in abundance</u>	
<u>Ambassis natalensis</u>	(8.64%)	<u>Solea bleekeri</u>	(1.53%)
<u>Rhabdosargus sarba</u>	(6.78%)	<u>Johnius bellengeri</u>	(1.53%)
<u>Elops machnata</u>	(5.26%)	<u>Atherina breviceps</u>	(1.29%)
		<u>Mugil cephalus</u>	(1.16%)
		<u>Anchoviella commersoni</u>	(1.15%)
		<u>Liza dumerili</u>	(1.09%)

The sampling gear used in this instance (i.e. juvenile seine nets) favoured the capture of small species and juveniles. Clearly a larger number of these fish increased in relative abundance, although juveniles of the important angling species, e.g. P. commersoni, R. holubi, R. sarba and E. machnata decreased in number.

DISCUSSION

Before discussing some of the changes that have taken place it should be pointed out that whereas the netting techniques and gear were similar during both programmes, the sampling localities and intensity of sampling were subject to a limited extent of variation. Consequently, only gross trends in the data should be considered as any small change in species composition or catch rate need not necessarily be a direct effect of salinity variation but could have resulted from different sampling techniques.

A further factor which may have artificially affected the changes in abundance are the higher lake levels prevalent in 1975. Increased lake levels would have effectively reduced the density of fish present, although the extent of this influence is unknown.

Nevertheless from the foregoing results it is apparent that the fish fauna of lake St. Lucia is variable and that its composition is to a large measure dictated by prevailing salinities. There is clearly a preference by many species for a certain salinity regime, for, despite the overall increase in the number of species and the catch per 24 net hours, there are several fish which were more common during periods of high salinity. It is interesting to note that these include the two important angling fish R. sarba and P. commersoni. Why this should be is uncertain but it is possible that favourable conditions arose as a result of their tolerance to

hypersalinity together with reduced competition of the less tolerant species.

Another feature that emerges is the much greater species diversity found in the South Lake during periods of high salinity. This fact stresses the importance of maintaining the South Lake in a viable condition during adverse conditions, as it then acts as a reservoir from which the rest of the lake can be restocked once favourable conditions return.

Considering those teleosts that thrived under the lower salinity regime of 1975 an interesting comparison may be drawn with the fish fauna of Richards Bay.

During 1969 and 1970 the ORI carried out research on the teleosts of Richards Bay with the identical sampling gear that was used for the St. Lucia survey.

The following list reflects the dominant species caught in Richards Bay in order of abundance.

Gill nets

Johnius belengeri
Argyrosomus hololepidotus
Leiognathus equulus
Thryssa vitrirostris
Hilsa kelee
Pomadasys hasta
Liza dumerili
Pomadasys commersonni
Valamugil buchanani
Elops machnata

Juvenile seine nets

Rhabdosargus holubi
Liza dumerili
Liza macrolepis
Ambassis natalensis
Rhabdosargus sarba
Terapon jarbua
Leiognathus equulus
Thryssa vitrirostris
Johnius belengeri
Hyporhamphus knysnaensis
Gilchristella aestuarius

Comparing the gill net caught fish it can be seen that virtually all the species that increased their numbers and catch rates in St. Lucia are amongst the ten dominant species occurring in Richards Bay. The fresh water cichlid S. mossambicus, R. sarba and C. chanos being the only exceptions.

Table 1. Checklist of species recorded in Lake St. Lucia during periods of high and low salinity.

	1970/1971		1975	
	North Lake	South Lake	South Lake	False Bay
<i>Acanthopagrus berda</i>	+	+	+	+
<i>Ambassis commersoni</i>		+	+	+
<i>Ambassis natalensis</i>	+	+	+	+
<i>Ambassis urotaenia</i>	+			
<i>Anchoviella commersoni</i>			+	+
<i>Argyrosomus hololepidotus</i>	+	+	+	+
<i>Arothron immaculatus</i>		+	+	
<i>Atherina breviceps</i>		+		
* <i>Barbus trimaculatus</i>				+
* <i>Barbus paludinosus</i>				+
<i>Caranx ignoblis</i>		+	+	+
<i>Caranx sexfasciatus</i>		+		+
<i>Carcharhinus leucas</i>		+	+	+
<i>Chanos chanos</i>	+		+	+
* <i>Clarias gariepinus</i>			+	+
<i>Crenidens crenidens</i>			+	
<i>Diplodus sargus</i>		+	+	+
<i>Elops machnata</i>	+	+	+	+
<i>Epinephelus guaza</i>		+	+	
<i>Epinephelus tauvina</i>		+	+	
<i>Gaterin niger</i>		+		
<i>Gerres acinaces</i>	+	+	+	+
<i>Gerres oblongus</i>		+		
<i>Gerres oyena</i>	+	+		
<i>Gerres punctatus</i>		+	+	
<i>Gerres rappi</i>			+	
<i>Gilchristella aestuarius</i>	+	+	+	+
<i>Gobius giurus</i>		+	+	+

Table 1 continued.

	1970/1971		1975	
	North Lake	South Lake	South Lake	False Bay
<i>Gobius nebulosus</i>		+		
<i>Hemirhamphus far</i>		+		
<i>Hilsa kelee</i>		+	+	+
<i>Histrion histrio</i>			+	
<i>Hyporhamphus improvisus</i>		+		
<i>Hyporhamphus knysnaensis</i>	+	+	+	+
<i>Johnius belengeri</i>		+	+	+
<i>Leiognathus equulus</i>	+	+	+	+
<i>Lethrinus rivulatus</i>				
<i>Lichia amia</i>	+	+	+	
<i>Liza alata</i>		+	+	
<i>Liza dumerili</i>	+	+	+	+
<i>Liza macrolepis</i>	+	+	+	+
<i>Liza tricuspidens</i>		+	+	
<i>Lobotes surinamensis</i>			+	
<i>Lutjanus argentimaculatus</i>		+		
<i>Lutjanus fulviflamma</i>		+	+	
<i>Megalops cyprinoides</i>		+	+	+
<i>Monodactylus argenteus</i>	+	+	+	
<i>Monodactylus falciformis</i>		+		
<i>Mugil cephalus</i>	+	+	+	+
<i>Muraenesox cinereus</i>		+	+	+
<i>Myxus capensis</i>	+	+	+	
<i>Otolithes ruber</i>		+	+	
<i>Pellonulops madagascariensis</i>		+		
<i>Pelates quadrilineatus</i>		+		
<i>Platycephalus indicus</i>		+	+	+
<i>Polydactylus sextarius</i>			+	
<i>Pomadasys commersonni</i>	+	+	+	+
<i>Pomadasys hasta</i>		+	+	+

Table 1 continued.

	1970/1971		1975	
	North Lake	South Lake	South Lake	False Bay
<i>Pomadasys multimaculatum</i>		+		
<i>Pomatomus saltatrix</i>		+	+	
* <i>Pseudocrenilabrus philander</i>			+	+
<i>Remora remora</i>			+	
<i>Rhabdosargus holubi</i>	+	+	+	+
<i>Rhabdosargus sarba</i>	+	+	+	+
<i>Rhabdosargus thorpei</i>		+	+	
<i>Rhizoprionodon acutis</i>		+		
* <i>Sarotherodon mossambicus</i>	+	+	+	+
<i>Scomberoides commersonianus</i>		+		
<i>Scomberoides tala</i>		+		
<i>Sillago sihama</i>		+		
<i>Solea bleekeri</i>	+	+	+	+
<i>Sphyraena</i> spp.		+	+	+
<i>Stigmatogobius dewaali</i>			+	+
<i>Syngnathus djarong</i>			+	+
<i>Terapon jarbua</i>	+	+	+	+
<i>Thryssa vitrirostris</i>	+	+	+	+
<i>Trachinotus africanus</i>			+	
<i>Tylosurus leiurus</i>		+	+	+
<i>Valamugil buchanani</i>	+	+	+	
<i>Valamugil cunnesius</i>	+	+	+	+
<i>Valamugil robustus</i>			+	
<i>Valamugil seheli</i>			+	
Total numbers:	26	62	59	39
*freshwater species	88		98	

Table 2. Catch per 24 gill net hours in the southern lake during periods of high and low salinity.

	1970	1975
Acanthopagrus berda	0.14	0.06
Ambassis commersoni		
Ambassis natalensis		
Ambassis urotaenia		
Anchoviella commersoni		
Argyrosomus hololepidotus	3.30	4.22
Arothron immaculatus		
Atherina breviceps		
*Barbus trimaculatus		
*Barbus paludinosus		
Caranx ignoblis		0.22
Caranx sexfasciatus	0.05	
Carcharhinus leucas	0.10	0.03
Chanos chanos		0.61
*Clarias gariepinus		0.03
Crenidens crenidens		0.08
Diplodus sargus	0.01	
Elops machnata	2.34	5.22
Epinephelus guaza		
Epinephelus tauvina	0.01	
Gaterin niger		
Gerres acinaces		
Gerres oblongus		
Gerres oyena	0.02	
Gerres punctatus		
Gerres rappi		
Gilchristella aestuarius		
Gobius giurus		

Table 2 continued.

	1970	1975
<i>Gobius nebulosus</i>		
<i>Hemirhamphus far</i>	0.01	
<i>Hilsa kelee</i>	0.12	15.31
<i>Histrion histrio</i>		
<i>Hyporhamphus improvisus</i>		
<i>Hyporhamphus knysnaensis</i>		
<i>Johnius belengeri</i>	2.47	9.97
<i>Leiognathus equulus</i>	0.01	0.58
<i>Lethrinus rivulatus</i>		
<i>Lichia amia</i>	0.12	0.25
<i>Liza alata</i>	0.04	
<i>Liza dumerili</i>	0.42	1.22
<i>Liza macrolepis</i>	1.65	1.44
<i>Liza tricuspidens</i>		
<i>Lobotes surinamensis</i>		
<i>Lutjanus argentimaculatus</i>	0.07	
<i>Lutjanus fulviflamma</i>		
<i>Megalops cyprinoides</i>	0.01	0.08
<i>Monodactylus argenteus</i>		
<i>Monodactylus falciformis</i>		
<i>Mugil cephalus</i>	5.37	4.39
<i>Muraenesox cinereus</i>	0.05	0.17
<i>Myxus capensis</i>		
<i>Otolithes ruber</i>	0.04	0.16
<i>Pellonulops madagascariensis</i>		
<i>Pelates quadrilineatus</i>		
<i>Platycephalus indicus</i>	0.22	0.22
<i>Polydactylus sextarius</i>		0.03
<i>Pomadasys commersonni</i>	3.71	3.67
<i>Pomadasys hasta</i>	0.11	0.16

Table 2 continued.

	1970	1975
Pomadasys multimaculatum	0.05	
Pomatomus saltatrix	0.03	0.03
*Pseudocrenilabrus philander		
Remora remora		
Rhabdosargus holubi	0.26	0.78
Rhabdosargus sarba	3.91	1.56
Rhabdosargus thorpei		
Rhizoprionodon acutis	0.01	
*Sarotherodon mossambicus		0.16
Scomberoides commersonianus	0.02	
Scomberoides tala		
Sillago sihama		
Solea bleekeri	0.04	0.19
Sphyræna spp.	0.08	0.11
Stigmatogobius dawaali		
Syngnathus djarong		
Terapon jarbua	0.01	0.11
Thryssa vitrirostris	1.77	5.86
Trachinotus africanus		0.03
Tylosurus leiurus	0.02	0.50
Valamugil buechanani	0.20	0.11
Valamugil cunnesius	0.23	0.03
Valamugil robustus		
Valamugil seheli		

*Freshwater species

Table 3. Percentage species composition of gill net samples during periods of high and low salinity.

	1970		1975
	North Lake	South Lake	Entire Lake
Acanthopagrus berda	0.52	0.50	0.16
Ambassis commersoni			
Ambassis natalensis			
Ambassis urotaenia			
Anchoviella commersoni			
Argyrosomus hololepidotus	0.35	12.21	7.28
Arothron immaculatus			
Atherina breviceps			
*Barbus trimaculatus			
*Barbus paludinosus			
Caranx ignobilis			0.33
Caranx sexfasciatus			
Carcharhinus leucas		0.37	0.04
Chanos chanos	2.25		0.76
*Clarias gariepinus			0.09
Crenidens crenidens			0.09
Diplodus sargus		0.03	
Elops machnata	9.34	8.69	16.47
Epinephelus guaza			
Epinephelus tauvina		0.03	
Gaterin niger			
Gerres acinaces			
Gerres oblongus			
Gerres oyena		0.07	
Gerres punctatus			
Gerres rappi			
Gilchristella aestuarius			
Gobius giurus			

Table 3 continued.

	1970		1975
	North Lake	South Lake	Entire Lake
<i>Gobius nebulosus</i>			
<i>Hemirhamphus far</i>		0.03	
<i>Hilsa kelee</i>		0.44	13.66
<i>Histrio histrio</i>			
<i>Hyporhamphus improvisus</i>			
<i>Hyporhamphus knysnaensis</i>			
<i>Johnius belengeri</i>		9.16	20.14
<i>Leiognathus equulus</i>		0.03	0.42
<i>Lethrinus rivulatus</i>			
<i>Lichia amia</i>		0.44	0.22
<i>Liza alata</i>		0.31	
<i>Liza dumerili</i>	11.76	1.54	1.00
<i>Liza macrolepis</i>	9.34	6.11	1.18
<i>Liza tricuspidens</i>			
<i>Lobotes surinamensis</i>			
<i>Lutjanus argentimaculatus</i>		0.27	
<i>Lutjanus fulviflamma</i>			
<i>Megalops cyprinoides</i>		0.03	0.09
<i>Monodactylus argenteus</i>			
<i>Monodactylus falciformis</i>			
<i>Mugil cephalus</i>	58.82	19.99	16.42
<i>Muraenesox cinereus</i>		0.17	0.22
<i>Myxus capensis</i>			
<i>Otolithes ruber</i>		0.13	0.16
<i>Pellonulops madagascariensis</i>			
<i>Pelates quadrilineatus</i>			
<i>Platycephalus indicus</i>		0.81	0.18
<i>Polydactylus sextarius</i>			0.02
<i>Pomadasys commersonni</i>	1.38	13.76	5.81
<i>Pomadasys hasta</i>		0.40	0.13

Table 3 continued.

	1970		1975
	North Lake	South Lake	Entire Lake
<i>Pomadasys multimaculatum</i>		0.20	
<i>Pomatomus saltatrix</i>		0.10	0.02
* <i>Pseudocrenilabrus philander</i>			
<i>Penora remora</i>			
<i>Rhabdosargus holubi</i>		0.97	0.69
<i>Rhabdosargus sarba</i>	2.25	14.50	2.18
<i>Rhabdosargus thorpei</i>			
<i>Rhizoprionodon acutis</i>		0.13	
* <i>Sarotherodon mossambicus</i>	0.17		1.34
<i>Scomberoides commersonianus</i>		0.07	
<i>Scomberoides tala</i>			
<i>Sillago sihama</i>			
<i>Solea bleekeri</i>		0.13	0.22
<i>Sphyraena</i> spp.		0.30	0.09
<i>Stigmatogobius dewaali</i>			
<i>Syngnathus djarong</i>			
<i>Tetraodon lineatus</i>	0.69	0.03	0.11
<i>Thryssa vitrirostris</i>		6.58	9.52
<i>Trechinotus africanus</i>			0.04
<i>Tylosurus leiurus</i>	0.17	0.07	0.73
<i>Valemugil buechanani</i>		0.74	0.09
<i>Valemugil cunnesius</i>	2.94	0.84	0.09
<i>Valemugil robustus</i>			
<i>Valemugil seheli</i>			

*freshwater species

n = 578

2 980

4 494

Table 4. Percentage species composition of juvenile seine net samples during periods of high and low salinity.

	1971		1975
	North Lake	South Lake	Entire Lake
<i>Acanthopagrus berda</i>	3.43	0.98	0.98
<i>Ambassis commersoni</i>		0.57	0.29
<i>Ambassis natalensis</i>	0.84	11.74	0.67
<i>Ambassis urotaenia</i>	0.38		
<i>Anchoviella commersoni</i>			1.15
<i>Argyrosomus hololepidotus</i>		0.04	0.01
<i>Arothron immaculatus</i>		0.07	0.01
<i>Atherina breviceps</i>		0.01	1.30
* <i>Barbus trimaculatus</i>			0.01
* <i>Barbus paludinosus</i>			0.05
<i>Caranx ignobilis</i>		0.18	0.05
<i>Caranx sexfasciatus</i>		0.01	
<i>Carcharhinus leucas</i>			
<i>Chanos chanos</i>	42.39		
* <i>Clarias gariepinus</i>			
<i>Crenidens crenidens</i>		0.01	0.01
<i>Diplodus sargus</i>		0.32	0.12
<i>Elops machnata</i>	23.54	0.29	0.19
<i>Epinephelus guaza</i>		0.01	
<i>Epinephelus tauvina</i>			0.01
<i>Gaterin niger</i>		0.06	
<i>Gerres acinaces</i>	0.08	2.23	0.78
<i>Gerres oblongus</i>		0.01	
<i>Gerres oyena</i>	0.71	0.43	
<i>Gerres punctatus</i>		0.19	0.02
<i>Gerres rappi</i>			0.17
<i>Gilchristella aestuarius</i>	2.34	5.70	20.63
<i>Gobius giurus</i>			0.63

Table 4 continued.

	1971		1975
	North Lake	South Lake	Entire Lake
<i>Gobius nebulosus</i>		0.12	
<i>Hemirhamphus far</i>			
<i>Hilsa kelee</i>		0.01	0.11
<i>Histrio histrio</i>			
<i>Hyporhamphus improvisus</i>		0.13	
<i>Hyporhamphus knysnaensis</i>	2.97	7.51	14.96
<i>Johnius belengeri</i>			1.53
<i>Leiognathus equulus</i>	0.04	1.41	1.83
<i>Lethrinus rivulatus</i>			0.01
<i>Lichia amia</i>	0.04	0.06	
<i>Liza alata</i>		0.22	0.20
<i>Liza dumerili</i>	0.79	1.52	2.45
<i>Liza macrolepis</i>	6.23	10.13	2.96
<i>Liza tricuspidens</i>		0.02	0.02
<i>Lobotes surinamensis</i>			
<i>Lutjanus argentimaculatus</i>		0.05	
<i>Lutjanus fulviflamma</i>		0.01	0.03
<i>Megalops cyprinoides</i>			
<i>Monodactylus argenteus</i>	0.13	0.48	0.32
<i>Monodactylus falciformis</i>		0.01	
<i>Mugil cephalus</i>	0.92	0.81	1.16
<i>Muraenesox cinereus</i>			
<i>Myxus capensis</i>	0.04	0.61	0.01
<i>Otolithes ruber</i>			
<i>Pellonulops madagascariensis</i>		0.68	
<i>Pelates quadrilineatus</i>		0.01	
<i>Platycephalus indicus</i>		0.01	0.02
<i>Polydactylus sextarius</i>			
<i>Pomadasys commersonni</i>	2.93	16.18	0.59
<i>Pomadasys hasta</i>		0.01	

Table 4 continued.

	1971		1975
	North Lake	South Lake	Entire Lake
<i>Pomadasys multimaculatum</i>			
<i>Pomatomus saltatrix</i>			
* <i>Pseudocrenilabrus philander</i>			
<i>Remora remora</i>			
<i>Rhabdosargus holubi</i>	4.06	14.73	3.20
<i>Rhabdosargus sarba</i>	1.76	13.76	4.31
<i>Rhabdosargus thorpei</i>		0.01	0.45
<i>Rhizoprionodon acutis</i>			
* <i>Sarotherodon mossambicus</i>	4.43	0.18	12.28
<i>Scomberoides commersonianus</i>			
<i>Scomberoides tala</i>		0.02	
<i>Sillago sihama</i>		0.02	
<i>Solea bleekeri</i>	0.38	0.67	2.61
<i>Sphyraena</i> spp.		0.01	0.09
<i>Stigmatogobius dewaali</i>			0.05
<i>Syngnathus djarong</i>			0.04
<i>Terapon jarbua</i>	0.75	3.07	1.72
<i>Thryssa vitrirostris</i>	0.08	3.45	21.18
<i>Trachinotus africanus</i>			
<i>Tylosurus leiurus</i>		0.02	0.13
<i>Valamugil buchani</i>	0.08	0.50	0.13
<i>Valamugil cunnesius</i>	0.13	0.69	0.21
<i>Valamugil robustus</i>			0.24
<i>Valamugil seheli</i>			0.18

n = 2 392

8 370

9 665

*Freshwater species

Table 4 continued.

	1971		1975
	North Lake	South Lake	Entire Lake
<i>Gobius nebulosus</i>		0.12	
<i>Hemirhamphus far</i>			
<i>Hilsa kelee</i>		0.01	0.11
<i>Histrio histrio</i>			
<i>Hyporhamphus improvisus</i>		0.13	
<i>Hyporhamphus knysnaensis</i>	2.97	7.51	14.96
<i>Johnius belengeri</i>			1.53
<i>Leiognathus equulus</i>	0.04	1.41	1.83
<i>Lethrinus rivulatus</i>			0.01
<i>Lichia amia</i>	0.04	0.06	
<i>Liza alata</i>		0.22	0.20
<i>Liza dumerili</i>	0.79	1.52	2.45
<i>Liza macrolepis</i>	6.23	10.13	2.96
<i>Liza tricuspidens</i>		0.02	0.02
<i>Lobotes surinamensis</i>			
<i>Lutjanus argentimaculatus</i>		0.05	
<i>Lutjanus fulviflamma</i>		0.01	0.03
<i>Megalops cyprinoides</i>			
<i>Monodactylus argenteus</i>	0.13	0.48	0.32
<i>Monodactylus falciformis</i>		0.01	
<i>Mugil cephalus</i>	0.92	0.81	1.16
<i>Muraenesox cinereus</i>			
<i>Myxus capensis</i>	0.04	0.61	0.01
<i>Otolithes ruber</i>			
<i>Pellonulops madagascariensis</i>		0.68	
<i>Pelates quadrilineatus</i>		0.01	
<i>Platycephalus indicus</i>		0.01	0.02
<i>Polydactylus sextarius</i>			
<i>Pomadasys commersonni</i>	2.93	16.18	0.59
<i>Pomadasys hasta</i>		0.01	

Table 4 continued.

	1971		1975
	North Lake	South Lake	Entire Lake
<i>Pomadasys multimaculatum</i>			
<i>Pomatomus saltatrix</i>			
* <i>Pseudocrenilabrus philander</i>			
<i>Remora remora</i>			
<i>Rhabdosargus holubi</i>	4.06	14.73	3.20
<i>Rhabdosargus sarba</i>	1.76	13.76	4.31
<i>Rhabdosargus thorpei</i>		0.01	0.45
<i>Rhizoprionodon acutis</i>			
* <i>Sarotherodon mossambicus</i>	4.43	0.18	12.28
<i>Scomberoides commersonianus</i>			
<i>Scomberoides tala</i>		0.02	
<i>Sillago sihama</i>		0.02	
<i>Solea bleekeri</i>	0.38	0.67	2.61
<i>Sphyraena</i> spp.		0.01	0.09
<i>Stigmatogobius dewaali</i>			0.05
<i>Syngnathus djarong</i>			0.04
<i>Terapon jarbua</i>	0.75	3.07	1.72
<i>Thryssa vitrirostris</i>	0.08	3.45	21.18
<i>Trachinotus africanus</i>			
<i>Tylosurus leiurus</i>		0.02	0.13
<i>Valamugil buchanani</i>	0.08	0.50	0.13
<i>Valamugil cunnesius</i>	0.13	0.69	0.21
<i>Valamugil robustus</i>			0.24
<i>Valamugil seheli</i>			0.18

n = 2 392

8 370

9 665

*Freshwater species